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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/549,842	09/16/2005	Yoshio Matsuzaki	4404.P0681US	6057

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EXAMINER	
LI, JUN	

ART UNIT	PAPER NUMBER
1793	

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12/23/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/549,842	MATSUZAKI ET AL.	
	Examiner	Art Unit	
	JUN LI	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure. The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited.

In the instant case, the abstract of the disclosure is objected to because the newly amended abstract exceeds the maximum 150 words limit. Correction is required. See MPEP § 608.01(b).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 36-47, 13, 19-27 and 29-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (US5372895) in view of Tsukuda (US6534211), Bates (US5143801) and Barker (US2005/0155490).

Sato teaches a method for manufacturing a solid oxide fuel cell module (column 1 lines 12-17) comprising a cell section 2 fabricated by forming on a porous base made of the electrode material for either a porous air electrode base 3 or a porous electrode base 11, an electrolyte film 4 an another electrolyte film 5 or an air electrode film 12 in order (Figure 1-2) (column 2 last 2 lines-column 3 first 5 lines) or fabricated by forming a second type as shown in Figure 3 and 4

(column 3 lines 5-9). Sato further teaches the cell section can be fitted into the predetermined holes on the dense substrate 1 (Figure 5, column 3 lines 18-26) and then forming interconnections 7 to connect adjacent cell-section electrodes in serial or parallel (column 3 lines 18-22). Sato also discloses that oxygen can be supplied into the hollow section 9 of the dense substrate 1 while the interconnections 7 connecting the substrate and the cells (Figure 13, column 4 lines 22-25, 60-64) wherein the dense substrate can be made form electrical insulating ceramic materials such as alumina, magnesia etc (column 3 lines 38-41). Sato further teaches pressing and firing the dense substrate (i.e. sintering the substrate) (column 4 lines 6-8). Sato already teaches interconnector can be made from a material such as perovskite oxide (column 3 lines 53-57).

Sato further teaches masking the porous air electrode bases 3 thus forming electrolyte film 4 and masking the electrolyte film 4 and spraying NiO-YSZ film on them to form fuel electrode films 5 (column 4 liens 14-20). Sato further teaches securing the formed cell sections on the dense substrate, masking the dense substrate, spraying $LaMgCrO_3$ on the dense substrate to make interconnections (column 4 lines 24-30). Sato also teaches forming interconnections and gas sealing films order can be reversed (column 4 lines 51-53) and fuel electrodes can be provided on the hollow section 9 side (Figure 10, 13).

Regarding claim 36-47,19-20, 22-27 and 29-32, Sato fails to expressly teach 1) co-sintering the fuel electrode, the electrolyte, and 2) the interconnector

made of material having a density that is not less than 90% of its theoretical density.

With respect to 1), Tsukuda teaches co-sintering the fuel electrode and the electrolyte and sintering the interconnector film (column 1 lines 55-60, column 4 liens 52-56). Tsukuda further teaches the sintering process providing a decreased shrinkage and an increased conductivity for the fuel cell constitution (column 2 lines 30-32).

It would have been obvious to one of ordinary skill in the art at the time of invention filed to adopt co-sintering steps as shown by Tsukuda to improve the solid oxide fuel cell manufacturing process of Sato. One of ordinary skill in the art would have been motivated to do so because co-sintering process can decrease shrinkage and increase conductivity for the fuel cell constitution as shown by Tsukuda (column 2 lines 30-32). Furthermore, adopting known techniques for improve efficiency of similar composition/method is well within the scope of one ordinary skill in the art.

With respect to 2), Bates teaches generally magnesium doped or strontium doped lanthanum chromites can be used as interconnectors (column 3 lines 26-28) and the thermal expansion coefficient can ranges $9.1X10^{-6}$ -- $10.6X10^{-6}$/K (column 3 last 3 lines -column 4 first 5 lines).

Barker teaches using silver mixture, a silver alloy, a silver composite such as silver or silver mixture or silver alloy in glass ([0090]) for connecting different layers in solid oxide fuel cells. Barker further teaches different metals such as gold, platinum and palladium can be used. Barker also discloses using about 10-

40% glass in the composite material and the proportion of silver and the glass can be adjusted for proper thermal expansion coefficient ([0028]) while the Ag proportion in the alloy will be not less than 50% ([0032]). Thus the recited weight percentage of the electroconductive material is an obvious modification over the prior art.

It would have been obvious to one of ordinary skill in the art at the time of invention filed to adopt the silver composite with glass as shown by Barker and electroconductive material as Bates to expand the precursor material for making a desired interconnector for intended uses in solid oxide fuel cell manufacturing process of Sato. One of ordinary skill in the art would have been motivated to do so because silver glass composite material and elctroconductive lanthanum oxide have been successfully used as connecting materials in solid oxide fuel cell application and adopting known techniques for improve efficiency of similar composition/method is well within the scope of one ordinary skill in the art. It is noted that substantially materials are used, thus similar densities is thus expected absent evidence to the contrary.

Regarding claim 13 and 33, Sato further teaches Ni-zirconia cermet is suitable for the fuel electrode (column 3 lines 46-47) and the interconnection material having an electronic conduction and stable in both an oxidizing atmosphere and reducing atmosphere, such as perovskite-type oxide ($LaCrO_3$) with addition of alkaline earth metals.

Regarding claim 21, Barker fails to expressly teach the softening point for the glass material. However, it is to be noted that the softening point is an

expected feature with the determined glass composition. It is noted that solid oxide fuel cell generally operating at high temperature up to 1000 ºC. It would have been obvious to one of ordinary skill in the art to choose a glass with a high softening point as recited in the instant claim to assure the usage of glass material during the high temperature operation of solid oxide fuel cell.

2. Claim 7-8 and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (US5372895) in view of Tsukuda (US6534211), Bates (US5143801) and Barker (US2005/0155490) as applied to claim 36-47, 13, 19-27 and 29-33 above, and further in view of Akiyama (JP07-326375).

Sato in view of Tsukuda, Bates and Barker fails to expressly teach using mixture containing $MgAl_2O_4$ with 20-70% MgO.

Akiyama teaches 20-50% weight of oxide of Mg can be used for the solid fuel cell tube substrate (abstract, claim 1) wherein magnesium oxide can be mixture of MgO and $MgAl_2O_4$(claim 2 [0014]).

It would have been obvious to one of ordinary skill in the art at the time of invention filed to adopt $MgAl_2O_4$ as shown by Akiyama to improve the solid oxide fuel cell manufacturing process of Sato in view of Tsukuda, Bates and Barker. One of ordinary skill in the art would have been motivated to do so because Sato in view of Tsukuda teaches using mixture of magnesia and alumina can be used for insulating material for internal tube substrate without specifically describing one while Akiyama teaches using a specific magnesium oxide $MgAl_2O_4$ with 20-50% MgO. Furthermore, adopting known techniques for improve efficiency of similar composition/method is well within the scope of one ordinary skill in the art.

Regarding claim 17 and 18, Akiyama further teaches Gd_2O_3 and CeO_2 can be added into the solid electrolyte membrane ([00200]).

It would have been obvious to one of ordinary adopting Gd and Ce as additive for electrolyte because doping of different oxide material for a desired thermal expansion and conductivity is commonly known in the art as indicated by Bates.

3. Claim 9-12, 14-16, 28 and 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (US5372895) in view of Tsukuda (US6534211), Bates (US5143801), Barker (US2005/0155490) as applied to claim 36-47, 13, 19-27 and 29-33 above, and further in view of Xue (US5807642).

Regarding claim 9-12 and 14-16, the references of Sato in view of Tsukuda , Bates and Barker fail to expressly teach using yttria stabilized zirconia as the support substrate constituent material for the solid oxide fuel cell. Bates teaches ytrria stabilized zirconium (up to 10%) can be used for manipulating the thermal expansion (column 3 lines 24-25) for the electrolyte and stabilized zirconia can be used as support tube material (column 3 lines 29-30). Bates further teaches manipulating different layers thermal expansion coefficient and conductivity via doping with different oxide for obtaining better solid oxide fuel cell (column 3 lines 8-16).

Xue teaches stabilized zirconia and alumina can be used as manifold support material but their relatively low thermal expansion coefficient will cause problems for thermal expansion mismatch and sealing the manifold to the stack (column 2 lines 1-4). Xue further teaches ytrrium, zirconium, nickel, scandium

oxide can be used as additive (less than 205 of the body) for adjust thermal expansion for the manifold support material (column 2 lines 38-46).

It would have been obvious to one of ordinary skill in the art at the time of invention filed to yttria stabilized zirconia as shown by Xue to improve the solid oxide fuel cell manufacturing process of Sato in view of Tsukuda, Bates and Barker. One of ordinary skill in the art would have been motivated to do so because yttria stabilized zirconia can modify the solid fuel cell material thermal expansion and manipulating different layers thermal expansion for making desired support material with desired thermal expansion for use in solid oxide fuel cell as indicated by Xue. Furthermore, adopting known techniques for improve efficiency of similar composition/method is well within the scope of one ordinary skill in the art.

Regarding claim 28 and 34-35, Sato already teaches perovksite oxide is stable under high temperature and has electroconductivity can be used as discussed above.

The references of Sato in view of Tsukuda and Bates and Barker fail to expressly teach using recited nobium doped titanate as the interconnect material.

Xue teaches less than 20% nobium (Nb) can be doped with barium titanate with proper thermal expansion for usage as component material for solid oxide fuel cell (column 2 lines 40-46).

It would have been obvious to one of ordinary skill in the art at the time of invention filed to adopt Nb doped titanate as a thermal expansion adjusting material or sintering aid as shown by Xue to expand the precursor material for

making a desired interconnector for intended uses in solid oxide fuel cell manufacturing process of Sato in view of Tsukuda and Bates with Barker. One of ordinary skill in the art would have been motivated to do so because Nb doped barium titanate material (a type of perovskite compound) has been successfully used as manufacturing materials in solid oxide fuel cell application and adopting known techniques for improve efficiency of similar composition/method is well within the scope of one ordinary skill in the art.

Response to Arguments

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection. In response to applicant's arguments about Sato in view of Tsukuda not teaching the recited density, it is noted that Barker teaches mixture of Ag and glass can be used as materials for connecting different layers in solid oxide fuel cells and Bates teaches generally magnesium doped or strontium doped lanthanum chromites can be used as interconnectors with desired thermal expansion coefficient to prevent solid oxide fuel cell destructions (column 3 lines 10-12). It would have been obvious to one of ordinary skill in the art to adopt such Ag and glass composite material as connecting parts of the interconnecters and to adopt doped lanthanum chromites to expand the interconnector material choices and such materials also provide good electrical conduction and conncections for different fuel cells as suggested by Barker and Bates. Further similar compound will have similar density. Thus different parts of the interconnectors with different density are thus an obvious modification over

the prior arts. As for the demonstrated data in example 3, it is noted that criticality or superior results as against to the applied reference is needed to demonstrate nonobviousness.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JUN LI whose telephone number is (571)270-5858. The examiner can normally be reached on Monday-Friday, 8:00am-5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JUN LI/
Examiner, Art Unit 1793
12/17/2009

/Melvin Curtis Mayes/
Supervisory Patent Examiner, Art Unit 1793